Genomic Data Analysis for Disease Research Training Course

Professional Development Training Course Outline

Category	Research and Data Analysis	**Duration**	5 Days
Base Fee	$1,500 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

In the era of precision medicine, genomic data analysis plays a pivotal role in transforming healthcare by uncovering the genetic underpinnings of diseases. Genomic Data Analysis for Disease Research Training Course equips researchers, bioinformaticians, healthcare professionals, and data scientists with hands-on skills to interpret complex genomic datasets and apply cutting-edge computational tools to disease research. This course is designed to bridge the gap between genomic science and clinical application by exploring next-generation sequencing (NGS), genome-wide association studies (GWAS), and variant calling pipelines to drive personalized medicine.

With the exponential growth of genomic data, it is crucial to understand how to manage, analyze, and derive meaningful insights for disease prediction, diagnosis, and treatment. This course emphasizes data-driven research, bioinformatics tools, and real-world case studies focused on diseases such as cancer, diabetes, and rare genetic disorders. Participants will master the use of platforms like R/Bioconductor, Python for genomics, UCSC Genome Browser, and cloud-based analysis via Amazon Web Services (AWS) and Google Genomics. The training is structured for both foundational learning and advanced practical application in biomedical research and public health.

Programme Curriculum

Genomic Data Analysis for Disease Research Training Course

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Course Objectives

1. Understand the fundamentals of genomics and bioinformatics.
2. Apply next-generation sequencing (NGS) data for disease research.
3. Utilize machine learning in genomic data interpretation.
4. Perform variant calling and annotation using open-source tools.
5. Explore RNA-Seq and transcriptomics for disease expression analysis.
6. Analyze data using R/Bioconductor and Python libraries.
7. Leverage cloud computing in genomics (AWS & Google Cloud).
8. Conduct genome-wide association studies (GWAS).
9. Evaluate epigenomic data for disease biomarkers.
10. Interpret clinical genomics datasets for diagnostics.
11. Integrate multi-omics data for systems biology.
12. Develop data visualization techniques for genomic insights.
13. Apply ethical and regulatory frameworks in genomic research.

Target Audiences

1. Biomedical researchers
2. Bioinformatics analysts
3. Clinical geneticists
4. Medical students and healthcare professionals
5. Public health specialists
6. Biotech and pharmaceutical scientists
7. Data scientists entering life sciences
8. Academic educators and postgraduate students

Course Duration: 5 days

Course Modules

Module 1: Foundations of Genomic Science

- Overview of DNA, RNA, and genes
- Introduction to genomics and transcriptomics
- Key databases (NCBI, Ensembl, UCSC)
- Central dogma in disease mechanisms
- Ethical considerations in genomic research
- **Case Study**: Genetic basis of cystic fibrosis

Module 2: Bioinformatics Tools and Pipelines

- Introduction to Bioconductor and Galaxy
- Setting up genomic workflows
- File formats: FASTQ, BAM, VCF

- Basic scripting with Bash and Python
- Annotation tools and reference genomes
- **Case Study**: Bioinformatics pipeline for rare genetic diseases

Module 3: Next-Generation Sequencing (NGS) Data Analysis

- Sequencing technologies overview
- Read alignment and quality control
- Variant calling and filtering
- Visualization with IGV
- Practical lab using sample datasets
- **Case Study**: Cancer genomics using NGS

Module 4: RNA-Seq and Transcriptomics

- RNA-Seq experimental design
- Data preprocessing and normalization
- Differential gene expression analysis
- Functional enrichment (GO/KEGG)
- Visualization using heatmaps and volcano plots
- **Case Study**: RNA-Seq in Alzheimer's disease research

Module 5: GWAS and Population Genomics

- GWAS principles and workflows
- SNP analysis and LD structures
- Case/control study designs
- Interpretation of GWAS hits
- Risk prediction models
- **Case Study**: GWAS in Type 2 Diabetes

Module 6: Epigenomics and Disease Biomarkers

- DNA methylation and histone modification
- ChIP-Seq and ATAC-Seq basics
- Integration with transcriptomics
- Epigenetic changes in cancer
- Biomarker discovery pipelines
- **Case Study**: Epigenetic signatures in breast cancer

Module 7: Cloud-Based Genomic Data Analysis

- Overview of cloud platforms (AWS, Google Genomics)
- Genomic pipeline deployment
- Cost-effective storage and computing
- Containerization with Docker
- Collaborative genomic platforms
- **Case Study**: Scalable TB genomics project in Africa

Module 8: Ethics, Law, and Future of Genomics

- Genetic data privacy laws (HIPAA, GDPR)
- Informed consent in genetic research
- Commercial genomic testing ethics
- Future of AI in genomics
- Diversity and inclusion in genomic datasets

- **Case Study**: Ethical dilemma in CRISPR clinical trials

Training Methodology

- Instructor-led lectures and video tutorials
- Hands-on bioinformatics labs with real datasets
- Interactive quizzes and discussion forums
- Group projects and peer reviews
- Use of open-source tools and cloud platforms

Register as a group from 3 participants for a Discount

Send us an email: info@fineskilltrainingcenter.org or call *+254769199797*

Certification

Upon successful completion of this training, participants will be issued with a globally- recognized certificate.

Tailor-Made Course

We also offer tailor-made courses based on your needs.

Key Notes

a. The participant must be conversant with English.

b. Upon completion of training the participant will be issued with an Authorized Training Certificate

c. Course duration is flexible and the contents can be modified to fit any number of days.

d. The course fee includes facilitation training materials, 2 coffee breaks, buffet lunch and A Certificate upon successful completion of Training.

e. One-year post-training support Consultation and Coaching provided after the course.

f. Payment should be done at least a week before commence of the training, to Fineskill Training Center account, as indicated in the invoice so as to enable us prepare better for you.

Upcoming Scheduled Sessions

Start Date	End Date	Location	Price
23 Nov 2026	27 Nov 2026	Online	$1,000
23 Nov 2026	27 Nov 2026	Physical	$1,500
23 Nov 2026	27 Nov 2026	Physical	$3,000
23 Nov 2026	27 Nov 2026	Physical	$3,000
23 Nov 2026	27 Nov 2026	Physical	$6,000

Start Date	End Date	Location	Price
23 Nov 2026	27 Nov 2026	Physical	$4,500
23 Nov 2026	27 Nov 2026	Physical	$6,000
23 Nov 2026	27 Nov 2026	Physical	$6,000

Ready to enroll or request a customized program? Book online or contact us:

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